

# Questions about how plants die leads to climate change answers

March 12, 2012



## How trees die in drought key to plant, climate change questions

How plants die during drought is one of the largest uncertainties in determining how plants will succumb to changing climate.

3:01

Tree Death Study's Climate Change Connection

LANL researchers Michelle Espy, Jesse Resnick, and Igor Savukov of Applied Modern Physics and Nathan McDowell and Sanna Sevanto of Earth System Observations have observed, for the first time, that water content can be monitored non-invasively

and unobtrusively in intact trees via ultra-low field (ULF) nuclear magnetic resonance (NMR).

## **Non-invasive method studies plant function and mortality**

As expected, water content correlates with the NMR signal. During three days of continuously monitoring an aspen tree suffering from drought, the researchers saw evidence of changes in water content for day versus night, as well as the overall decline in water content as the tree's health declined.

Although high field magnetic resonance imaging (MRI) has been used for *in vivo* water measurements, the research represents a first *in vivo* application of the ULF-NMR method to the study of plant function and mortality.

Ultra-low field nuclear magnetic resonance instrumentation can be made simple and portable and adapts non-invasively to the tree. The work demonstrates that the combination of LANL's unique abilities in ULF magnetic resonance imaging (MRI) and climate-driven vegetation mortality research can provide understanding of plant function and mortality.

## **Understanding mechanisms of plant mortality helps future climate forecasting**

The scientists' goal is to provide basic insights into questions such as how plants die, especially during drought. While the question of plant mortality is easy to conceptualize, it is difficult to study because of the spatial and temporal variation of processes over the plant.

Understanding these mechanisms of mortality, especially the tipping points, will provide important input to forecasts of future climate because current models cannot simulate vegetation change and related climate effects. The LANL research represents a first step towards fieldable, non-invasive monitoring to answer these fundamental questions.

## **Work is first look into how water movement changes in a tree**

Additional validation with traditionally accepted environmental methods is underway. If validated, the work appears to represent a first non-invasive look at how water movement changes inside an aspen tree over time and during the onset of mortality using the ULF-NMR method.

**Los Alamos National Laboratory**

**[www.lanl.gov](http://www.lanl.gov)**

**(505) 667-7000**

**Los Alamos, NM**

Operated by Los Alamos National Security, LLC for the Department of Energy's NNSA

